DTO

VACE
Video Analysis
Content Extraction

Text Recognition Evaluation

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RT 2006

USF
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NIST
National Institute of
Standards and Technology

VideoMining

Overview

- Introduction
- Task Definition
- Annotations
- Metrics
- Scores
- Conclusions

Introduction

- DTO funded
- Coordinated by NIST
- Univ. of South Florida (USF) and VideoMining (VM) team
- ViPER: Annotation tool developed by Univ. of Maryland (UMD)
- Data distribution managed by LDC/NIST

How we have Evolved

- VACE-I
  - Detection
  - Tracking (given first frame reference)
- VACE-II
  - Detection and Tracking on a bigger dataset (50/50)
  - No reference given
  - Pilot evaluation on Text Recognition
    - BBN/SRI (single participant)

Text: Task Definitions

- Detection Task: Spatially locate the blocks of text in each video frame in a video sequence
  - Text blocks (objects) contain all words in a particular line of text where the font and size are the same
- Tracking Task: Spatially/temporally locate and track the text objects in a video sequence
- Recognition Task: Transcribe the words in each frame, including their spatial location (detection implied)
- Currently use Broadcast News data

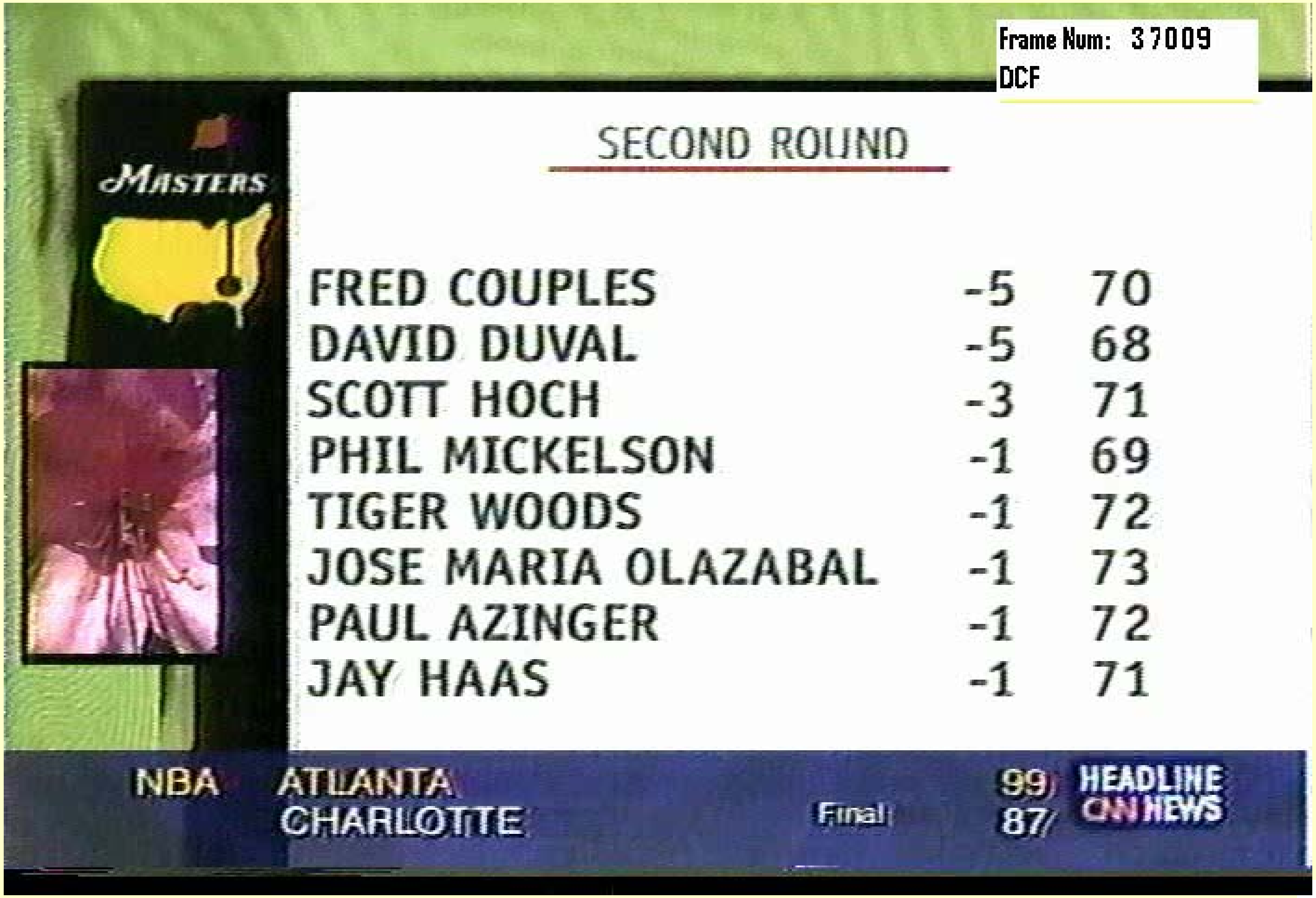
Task Definition Highlights

- Annotate oriented bounding rectangle around text objects
- Detection and Tracking task
  - Line level annotation with IDs maintained
  - Rules based on similarity of font, proximity and readability levels
- Recognition task
  - Word Level (IDs maintained)
- Documents
  - Annotation guidelines
  - Evaluation protocol
- Tools
  - ViPER (Annotation)
  - USF-DATE (Scoring)

What types of Text are evaluated?

- Evaluate only the most easily readable text (to establish a baseline at a high level of inter-annotator agreement)
  - Type = graphic (no scene text)
  - Readability = 2
  - Logo = false
  - Occlusion = false
  - Ambiguous = false
    - Exclude scrolling (ticker), dynamic text (scoreboard)
  - Case insensitive and punctuation ignored

Sample Annotation Clip



Frame Num: 37009

DCF

SECOND ROUND

FRED COUPLES	-5	70
DAVID DUVAL	-5	68
SCOTT HOCH	-3	71
PHIL MICKELSON	-1	69
TIGER WOODS	-1	72
JOSE MARIA OLAZABAL	-1	73
PAUL AZINGER	-1	72
JAY HAAS	-1	71

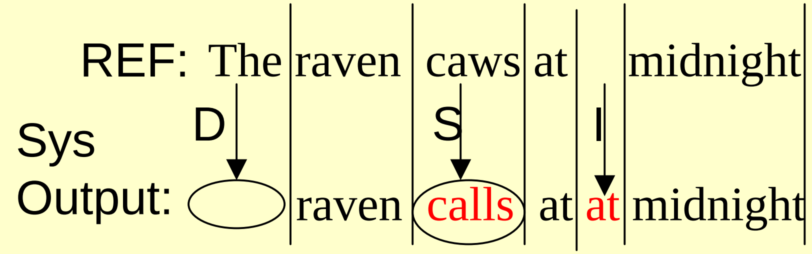
NBA ATLANTA 99

CHARLOTTE Final 87

Metrics

- Spatially map system output detected words to reference words, then compare the strings for mapped words
  - An unmapped word in system output incurs an Insertion (I) error
  - An unmapped word in reference incurs a Deletion (D) error
  - A mapped word with a character mismatch incurs a Substitution (S) error

$$\mathrm{WER} = \frac{(\mathrm{I}+\mathrm{D}+\mathrm{S})}{(\text{Total \# Words in Ref})}$$



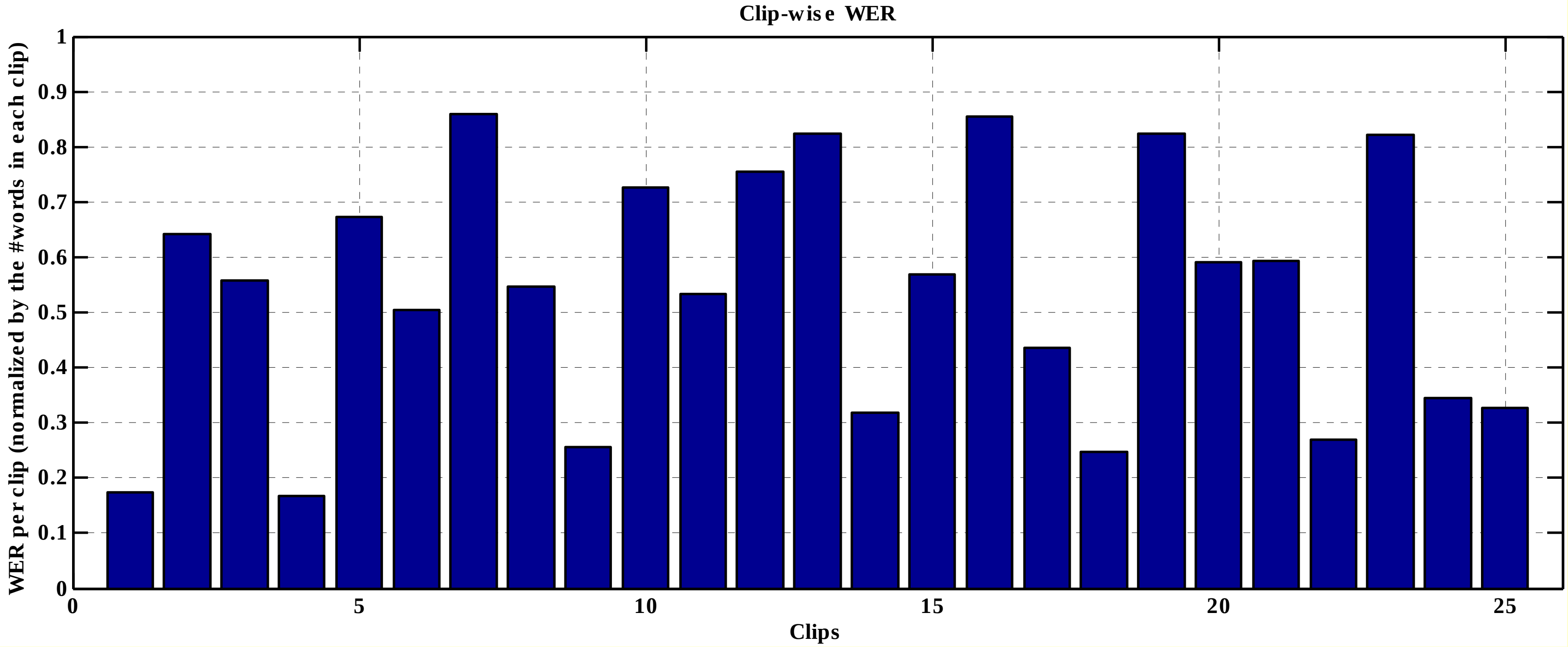
WER = (1 + 1 + 1)/5 = 3/5 (60%)

- Errors are accumulated over entire test set
- Also generate: Character Error Rate

Datasets

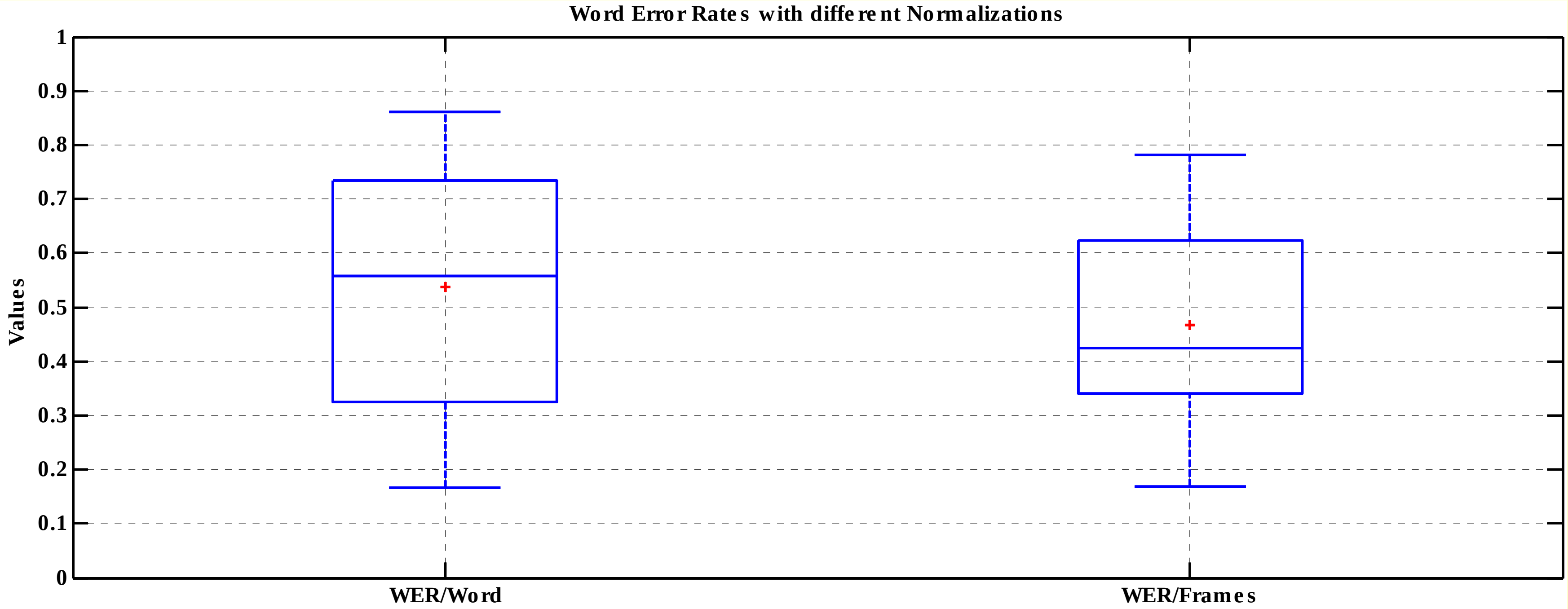
- Broadcast News (1998 TDT corpus)
- Training/Dry Run Development Set
  - 5 Clips
    - 14.5 minutes
    - 1181 words
- Evaluation Set
  - 25 Clips
    - 62.5 minutes
    - 4178 word objects
    - 68,738 word frame instances

Individual Clip WER



Scores (Word Error Rate)

Participants: SRI/BBN



WER	CER
0.4233	0.2823

Discussions

- Harder to recognize if the word occurs rarely?
  - Further analysis needed to verify this
- Total number of words in test set: 68,738
- Total number of System generated words: 54,628
  - Detection and Recognition errors

Conclusions

- Successful Pilot project
- Ported ASR metrics to Video evaluations
- Good Baseline result

Future Work

- More challenging forms of text
  - Non—Broadcast News domains (MRoom, Surveillance) and foreign BNews (Chinese + Arabic)
  - Handwritten, dynamic, scrolling, harder to read, scene?
- Text object structural and semantic grouping
  - Will enable non—bag–of –words NL processing

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Thanks
&
Questions